Claims 12 through 15, which only define the particular materials of the earlier versions of Claims 3, 4, 8, and 9. With these claim amendments, Applicants respectfully submit that Claims 3, 4, 8, and 9 are clear for the purposes of 35 U.S.C. §112, second paragraph. Accordingly, Applicants respectfully request the withdrawal of this § 112 rejection.

Claims 1-11 stand rejected under 35 U.S.C. § 103 as being unpatentable over United States Patent No. 6,280,813 to Carey et al. in view of United States Patent No. 6,221,481 to Wu et al. Applicants respectfully traverse this rejection.

Applicants respectfully submit that one of ordinary skill in the art, upon considering the Wu et al. reference, would not have modified the magnetic recording medium of Carey et al. in the manner proposed by the Examiner, and therefore the claimed invention of independent Claims 1 and 10 would not have resulted.

The Carey et al. reference shows a magnetic recording medium that includes, as shown in Figure 3, two CoPtCrB ferromagnetic films that sandwich a non-ferromagnetic spacer film made from Ru (with optional Co interface films surrounding the Ru film). As correctly acknowledged by the Examiner, the Carey et al. reference fails to disclose or suggest the claimed lattice mismatch of 6% or less between the spacer film and the ferromagnetic films. Accordingly, the Examiner relied upon the Wu et al. reference.

However, the Wu et al. reference merely mentions that a high Cr content of a CoCrTa intermediate magnetic alloy layer provides a smooth lattice match transition for epitaxial growth of a magnetic layer thereon exhibiting high anisotropy, thereby achieving high remanent coercivity (Hr) and high SNR. The Wu et al. reference is silent with regard to

a magnetic recording medium having an exchange layer structure with a ferromagnetic layer and a magnetic layer having antiparallel magnetizations, and how the lattice match affects the antiparallel magnetizations.

The Wu et al. reference also fails to disclose or suggest a range of the lattice mismatch between a non-magnetic coupling layer and magnetic and ferromagnetic layers disposed above and below the non-magnetic coupling layer of an exchange layer structure that would maintain the antiparallel magnetizations of the magnetic and ferromagnetic layers of the recording medium having the exchange layer structure.

When an element is added to Ru that forms the non-magnetic coupling layer of an exchange layer structure, measures must be taken so that the added element will not adversely affect the antiparallel magnetizations of the ferromagnetic layer and the magnetic layer. However, neither the Carey et al. reference nor the Wu et al. reference recognize this problem.

On the other hand, in the present invention, measures are taken so that it is possible to simultaneously improve the lattice matching between the non-magnetic coupling layer and the magnetic and ferromagnetic layers disposed above and below the non-magnetic coupling layer, and to maintain the antiparallel magnetizations of the magnetic and ferromagnetic layers. More particularly, the non-magnetic coupling layer is made of an Ru-M3 alloy, where M3 is an added element or alloy, and a lattice mismatch between the non-magnetic coupling layer and the magnetic and ferromagnetic layers is adjusted to approximately 6% or less by the addition of M3.

The addition of M3 to the Ru-M3 alloy that forms the non-magnetic coupling layer of the exchange layer structure for simultaneously improving the lattice matching and maintaining the antiparallel magnetizations is not obvious, even if the Carey et al. reference and the Wu et al. reference are combined, because both of these references fail to recognize the problem described above. Accordingly, for the foregoing reasons, Applicants respectfully request the withdrawal of the §103 rejection of independent Claims 1 and 10, and associated dependent Claims 2-9 and 11, under the combination of Carey et al. and Wu et al.

For all of the above reasons, Applicants request reconsideration and allowance of the claimed invention. Should the Examiner be of the opinion that a telephone conference would aid in the prosecution of the application, or that outstanding issues exist, the Examiner is invited to contact the undersigned.

Respectfully submitted,

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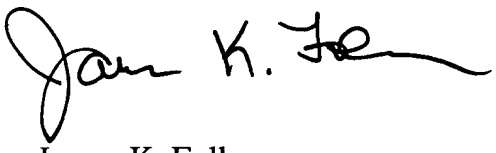
By 

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Claims:

Claims 3-5, 8, 9 and 11 have been amended; and new Claims 12-15 have been added as follows:

3. (Twice Amended) The magnetic recording medium as claimed in claim 1, wherein said ferromagnetic layer is made of a material selected from a group consisting of Co, Ni, Fe, Ni alloys, Fe alloys, and Co alloys. ~~which include CoCrTa, CoCrPt and CoCrPt-M2, where M2 = B, Mo, Nb, Ta, W, Cu or alloys thereof.~~

4. (Twice Amended) The magnetic recording medium as claimed in claim 1, wherein said magnetic layer is made of a material selected from a group consisting of Co and Co alloys. ~~which include CoCrTa, CoCrPt and CoCrPt-M4, where M4 = B, Mo, Nb, Ta, W, Cu or allows thereof.~~

5. (Once Amended) ~~A~~The magnetic recording medium as claimed in claim 1, wherein ~~comprising:~~

~~at least one exchange layer structure; and~~

~~a magnetic layer formed on said exchange layer structure,~~

~~said exchange layer structure comprising a ferromagnetic layer, and a non-magnetic coupling layer provided on said ferromagnetic layer and under said magnetic layer,~~

~~said ferromagnetic layer and said magnetic layer having antiparallel magnetizations,~~

~~said non-magnetic coupling layer being made of a Ru-M3 alloy, where~~ M3 = Co, Cr, Fe, Ni, Mn or alloys thereof.

8. (Twice Amended) The magnetic recording medium as claimed in claim 5, wherein said ferromagnetic layer is made of a material selected from a group consisting of Co, Ni, Fe, Ni alloys, Fe alloys, and Co allows. ~~which include CoCrTa, CoCrPt and CoCrPt-M2, where M2 = B, Mo, Nb, Ta, W, Cu or alloys thereof.~~

9. (Twice Amended) The magnetic recording medium as claimed in claim 5, wherein said magnetic layer is made of a material selected from a group consisting of Co and Co alloys. ~~which include CoCrTa, CoCrPt and CoCrPt-M4, where M4 = B, Mo, Nb, Ta, W, Cu or alloys thereof.~~

11. (Once Amended) ~~A~~The magnetic storage apparatus as claimed in claim 10, wherein~~comprising:~~

~~at least one magnetic recording medium comprising at least one exchange layer structure, and a magnetic layer formed on said exchange layer structure,~~

~~said exchange layer structure comprising a ferromagnetic layer, and a non-magnetic coupling layer provided on said ferromagnetic layer and under said magnetic layer,~~

~~said ferromagnetic layer and said magnetic layer having antiparallel magnetizations,~~

~~said non-magnetic coupling layer being made of a Ru-M3 alloy, where~~ M3 = Co, Cr, Fe, Ni, Mn or alloys thereof.

12. (New Claim) The magnetic recording medium as claimed in claim 3, wherein said ferromagnetic layer is made of a material selected from a group consisting of CoCrTa, CoCrPt and CoCrPt-M2, where M2 = B, Mo, Nb, Ta, W, Cu or alloys thereof.

13. (New Claim) The magnetic recording medium as claimed in claim 4, wherein said magnetic layer is made of a material selected from a group consisting of CoCrTa, CoCrPt and CoCrPt-M4, where M4 = B, Mo, Nb, Ta, W, Cu or allows thereof.

14. (New Claim) The magnetic recording medium as claimed in claim 8, wherein said ferromagnetic layer is made of a Co alloy selected from a group consisting of CoCrTa, CoCrPt and CoCrPt-M2, where M2 = B, Mo, Nb, Ta, W, Cu or alloys thereof.

15. (New Claim) The magnetic recording medium as claimed in claim 9, wherein said magnetic layer is made of a Co alloy selected from a group consisting of CoCrTa, CoCrPt and CoCrPt-M4, where M4 = B, Mo, Nb, Ta, W, Cu or alloys thereof.